Mammuthus primigenius (BLUMENBACH, 1799) FROM SALCIA (MEHEDINȚI COUNTY, SW ROMANIA)

POPESCU Aurelian, DIACONU Florina

Abstract. Following the excavations done in 1974 in a quarry near Salcia (Mehedinți County, south-western Romania), four complete mammoth molars, as well as a molar fragment were discovered. The molars were curate at the Iron Gates Region Museum from Drobeta Turnu Severin. They were firstly assigned to the steppe mammoth, *Mammuthus trogontherii.* Herein, these fossils have been reassessed to the woolly mammoth, *Mammuthus primigenius.*

Keywords: steppe mammoth, woolly mammoth, Pleistocene, Oltenia, Romania.

Rezumat. *Mammuthus primigenius* (Blumenbach, 1799) de la Salcia (jud. Mehedinți), SV României. În urma excavațiilor întreprinse în anul 1974 într-o carieră de pe raza localității Salcia (jud. Mehedinți, Sud-Vestul României), au fost descoperiți patru molari întregi de mamut, precum și un fragment. Molarii au intrat în patrimoniul Muzeului Regiunii Porților de Fier din Drobeta Turnu Severin, fiind atribuiți speciei *Mammuthus trogontherii*. În urma revizuirii întreprinse de autorii lucrării, molarii au fost reconsiderați ca revenind speciei *Mammuthus primigenius.*

Cuvinte cheie: mamut de stepă, mamut lânos, Pleistocen, Oltenia, Romania.

INTRODUCTION

The village Salcia is located in SW Romania, in Mehedinți County (Fig. 1). From a geological viewpoint, this locality belongs to the Wallachian Platform, namely to the last sedimentary megasequence, Middle Miocene (Badenian) - Quaternary (MUTIHAC, 1990). Around Salcia, the prevailing exposed formations are the Holocene and Pleistocene fluvial terraces, with clays, sands and gravels (Fig. 2).

Figure 1. Salcia on the map of Romania.

Figure 2. Salcia on the Geological map of Romania, *folio* L-34-XXXV, sc. 1:200000 (Geological Institute of Romania).
LEGEND: qh_2 – Late Holocene (gravel, sand, clay); qh_1 – Early Holocene (gravel, sand, clay); qp_3^3, qp_3^2, qp_3^1 – Late Pleistocene (gravel, sand, loess-like deposits); qp_1^1 – Early Pleistocene (gravel, sand); p - Pontian (clay, marl, sand); star - Salcia quarry.

In 1974, the workers from the quarry located near the village informed Mrs. Maria Bălăceanu, a teacher from the local school, about the discovery of three mammoth molars. After her visit on the site, two more molars were found.

These teeth were kept in the local school for a while, before being sent with the help of professor Ion Stângă, a curator by trade, to the Iron Gates Region Museum. There, these five molars were studied by Teodor Paveloiu, who concluded that they had belonged to the steppe mammoth, *Mammuthus trogontherii*.

Herein, these fossils have been reassessed to the woolly mammoth, *M. primigenius*.

MATERIAL AND METHODS

The molars discovered at Salcia belong to the Natural Sciences Department in the Iron Gates Region Museum (abbreviated: IGRM), with the following inventory numbers:

- M3 sin - inv. no. 22 (old inv. no. - 1420)
- m3dex - inv. no. 21 (old inv. no. - 1421)
- m2 sin - inv. no. 20 (old inv. no. - 1422)
- m1 sin - inv. no. 23 (old inv. no. - 1423)
- m? fragment - inv. no. 24 (old inv. no. - 1424)

The molars were measured (length, width, height), the lamellar frequency established, as well as the enamel thickness, and calculation of the hypsodonty index and the length/width ratio. The measurements followed the methods from MAGLIO (1973) and LISTER (1996). We used VAUFRAY (in PIVETEAU, 1958) for the species assignation.

Considering the fact that the molars were initially thought to belong to *Mammuthus trogontherii*, we compared them to similar teeth as well as to the ones of the woolly mammoth.

RESULTS AND DISCUSSIONS

Class Mammalia
Order Proboscidea ILLINGER 1811
Family Elephantidae GRAY 1821
Subfamily Mammuthinae SIMPSON 1845
Genus *Mammuthus* BURNETT 1830
Mammuthus primigenius (BLUMENBACH 1799)

We examined each molar separately in order to place a diagnosis. Molar sizes are expressed in millimetres.

M3 sin. - inv. no. 22/1420

(Pl. I, 1a-c)

Whole molar, all lamellae preserved, except for the first talon. The molar is almost wholly preserved, with the exception of insignificant damage to the front talon, the sides and the roots, which miss. A thin layer of brown-yellow (ochre) cement covers almost entirely the sides of the molar.

Table 1. Measurements of *M. primigenius* M3 sin from Salcia, and M3 sin of *M. trogontherii* from Nolhac (MOL & LACOMBAT, 2009)

Catalogue number	Salcia M3 sin. 22/1420	Nolhac M3 sin. 2008-10-2-NOL
Lamellar formula	x19(1)x	19x
Number of lamellae in use	12	12
Maximum length of molar	251.9	355
Maximum occlusal length	192.9	202
Maximum width (measured at lamella ....)	97.4(VI)	118(VII)
Number of lamellae/10 cm (lamellar frequency)	8	6
Thickness of enamel	2.5	2.5
Maximum height of crown (measured at lamella ....)	146,5(XIV)	183
L/l	2.58	
H/l	1.50	

By examining the values in Table 1, we can see that the molar found at Salcia is relatively small, even for *M. primigenius*, while the one from Nolhac is relatively larger, even for the *M. trogontherii*. The molar found at Salcia could originate from a female mammoth, while the one from Nolhac - to a male. Although the difference in size between the two molars could be attributed to sexual dimorphism, this would only in small part sustain the theory according to which they had belonged to the same species (*M. trogontherii*). Attention should also be paid to the fact that the M3 measurement values fit perfectly into the accepted parameters for the *M. primigenius.* The high lamellar frequency (8), as well as the size values (Table 1), led to the conclusion that, undoubtedly, the M3 found at Salcia belongs to the *M. primigenius*.

The left upper M3 found at Salcia and its state of wear can be placed in LAWS' (1966) age group XXIII-XXIV given 43 ± 2 AEY to 45 ± 2 AEY. The earliest possible age of death for the Salcia specimen would have been 41 and the latest, 47 African Elephant Years.

m3 dext. - inv. No. 21/1421
(Pl. I, 2a - c)

Whole molar, all lamellae preserved, except for the first one, only partially preserved. A thin layer of brown-yellow (ochre) cement covers almost completely the sides of the molar. Roots are no longer present.

By examining the values in Table 2, we can see that they fit the accepted sizes for the *M. primigenius.* By comparing the size of the Salcia molar to those of the Süsseborn specimens (LISTER et al., 2012), it is obvious that all of the latter ones are larger, which is normal, considering the size difference between the two species. On this argument, as well as the lamellar frequency of the Salcia m3 (7.5), we draw the conclusion that it belonged to the woolly mammoth and not to the steppe mammoth.

Table 2. Measurements of *M. primigenius* m3 dext. from Salcia, and *M. trogontherii* m3 from Süssenborn (LISTER et al., 2012).

Catalogue number	**Salcia m3 dext. 21/1421**	**Süssenborn m3 *M. trogontherii***
Lamellar formula	18x	17 - 21
Number of lamellae in use	13	
Maximum length of molar	258.8	299 - 393; 341 ± 6.5; n = 17
Maximum occlusal length	181.2	
Maximum width (measured at lamella ....)	95.9(IV)	83 - 118; 97.7 ± 2.0; n = 26
Number of lamellae at 10 cm interval (lamellar frequency)	7.5	4.45 - 6.84; 5.27 ± 0.10; n = 27
Thickness of enamel	2.2	2 - 3; 2.46 ± 0.05; n = 23
Maximum height of crown (measured at lamella ....)	111.9((XII)	134 - 160; 153.0 ± 3.9; n = 6
L/l	2.69	
H/l	1.16	

By examining the values in Table 2, we can see that they fit the accepted sizes for the *M. primigenius.* By comparing the size of the Salcia molar to those of the Süsseborn specimens, it is obvious that all of the latter ones are larger, which is normal, considering the size difference between the two species. On this argument, as well as the lamellar frequency of the Salcia m3 (7.5), we draw the conclusion that it belonged to the woolly mammoth and not to the steppe mammoth.

The m3 from Salcia and its state of wear can be placed in the Age group XXIII-XXIV given 43 ± 2 AEY to 45 ± 2 AEY. The earliest possible age of death for the Salcia specimen would have been 41 and the latest, 47 African Elephant Years.

m2-3? sin. – inv no. 20/1422
(Pl. I, 3a - c)

Whole molar, all lamellae preserved, except for the first talon, from which only a fragment remains. A thin layer of brown-yellow (ochre) cement covers almost entirely the sides of the molar. Roots are no longer present.

Examining the molar size values (Table 3), one can see that it fits the normal parameters of a *M. primigenius* m3 (PIVETEAU, 1958), except for the number of lamellae, too low for an m3. Its characteristics partially overlap with those of a similar molar from the *M. trogontherii*, but the lamellar frequency - 8 for the Salcia m3 is much higher than that of an *M. trogonteherii*'s, which is a maximum of 6.5. Keeping all this in mind, we conclude that this molar also belongs to the woolly mammoth.

Table 3. Measurements of m2-3? sin. inv. no. 20/1422 of Salcia and m3 of *M. primigenius* and m3 *M. trogontherii*, m2 and m3 *M. primigenius* of VAUFRAY, 1958.

Catalogue number	**Salcia m2-3? sin. 20/1422**	**m3 *M. trogontherii* (PIVETEAU, 1958)**	**m3 *M. primigenius* (PIVETEAU, 1958)**	**m2 *M. primigenius* (PIVETEAU, 1958)**
Lamellar formula	x15x	13-21	18 - 24	14 - 18
Number of lamellae in use	12			
Maximum length of molar	238.8	210 - 380	207 - 288	182 - 230
Maximum occlusal length	167.9			
Maximum width (measured at lamella ….)	96.2 (VI)	82 - 110	65-100	73 - 90
Number of lamellae at 10 cm interval (lamellar frequency)	7.5 - 8	5 - 6.5	7.5 - 10	8 - 10
Thickness of enamel	2.35			
Maximum height of crown (measured at lamella ….)	120.5 (XII)			
L/l	2.47	2.19 - 4.63	2.30 - 2.70	2.34 - 2.95
H/l	1.25			

The lower left m2 of Salcia and its state of wear can be placed in the Age group XIV-XV given 22 ± 2 AEY to 24 ± 2 AEY. The earliest possible age of death of the Salcia specimen would have been 20 and the latest, 26 African Elephant Years.

m1 sin., inv.no. 23/1423

(Pl. I, 4a - c)

Molar wholly preserved, with 10 lamellae, all in use, an anterior talon, three quarters of which are well preserved and a posterior talon, mostly preserved. Roots are mostly well preserved, only a little damaged at the tips. The white cement can be found between the lamellae (interlamellar space), but not on the lamellae.

The size values (Table 4) fit within the accepted parameters for a *M. primigenius* m1. We used for comparison the measurement of m1 *M. primigenius* values for the Ilskaya 1 and 2 and Chokurcha.

Table 4. Measurements of m1 sin. inv. no. 23/1423 from Salcia and m1 of *M. primigenius* from Ilskaya 1 and 2 and Chokurcha11 (BARYSHNIKOV, 2003).

Catalogue number	**Salcia m1 sin. 23/1423**	**Ilskaya 1 and 2 m1**	**Chokurcha 1 m1**
Lamellar formula	x10x		
Number of lamellae in use	10	> 10	
Maximum length of molar	145.20		
Maximum occlusal length	145.2		
Maximum width (measured at lamella ....)	63.5(III)	56;	56-70; x = 61.2
Number of lamellae at 10 cm interval (Lamellar frequency)	7.5	10; 10	8 - 11
Thickness of enamel	1.9	1.1; 1.9	1.7 - 2.1
Maximum height of crown (measured at lamella ....)	69.8(X)	105; 81	100
L/l	2.28		
H/l	0.90		

The m1 from Salcia and its state of wear can be placed in the Age group XI given 15 ± 1 AEY. The earliest possible age of death of the Salcia specimen would have been 14 and the latest, 16 African Elephant Years.

m? Fragment – inv.no. 24/1424

(Pl. I, 5a - c)

Fragment consisting of 4 lamellae probably originating from a lower molar.

Considering the conditions in which the fragment was discovered, the size of the lamellae, as well as the lamellar frequency (the measurements were obviously extrapolated), we consider that it belongs to a lower m2-m3 *Mammuthus primigenius*.

CONCLUSIONS

The mammoth molars discovered in the quarry near Salcia are, all but one, whole and well preserved. Although firstly assigned to *M. trogontherii*, following a careful examination, as well as measurements and comparisons to similar pieces already described, they are reassessed to the woolly mammoth (*M. primigenius*). Following the publication of the research concerning the Salcia molars, a new woolly mammoth locality is added for the Pleistocene of Romania.

AKNOWLEDGEMENTS

The authors thank Mrs. Maria Bălaceanu for the precious information regarding the discovery of the molars, as well as for her availability to accompany them to Salcia, in order to locate the quarry where the molars were discovered.

REFERENCES

BARYSHNIKOV G. 2003. *Mammuthus primigenius* from the Crimea and the Caucasus - in: Reumer, J. W. F. De Vos J. & Mol D. (eds.) - *Advances in mammoth research* (*Proceedings of the Second International Mammoth Conference, Rotterdam, May 16-20, 1999*). *Deinsea* **9**: 41-56.

LAWS R. M. 1966. Age criteria for the African elephant, *Loxodonta a. africana*. *East African Wildlife Journal*. **4**: 1-37.

LISTER A. M. 1996. Evolution and taxonomy of Eurasian mammoths. In: SHOSHANI J. & TASSY P. (Eds.), *The Proboscidea*. Oxford University Press. Oxford: 203-213.

LISTER A., DIMITRIJEVIC V., MARKOVIC Z., KNEZEVIC S., MOL D. 2012. A skeleton of 'steppe' mammoth (*Mammuthus trogontherii* (Pohlig)) from Drmno, near Kostolac, Serbia. *Quaternary International*. **276-277**: 129-144.

MAGLIO V. J. 1973. Origin and evolution of the Elephantidae. *Transactions of the American Philosophical Society*. New Series. The American Philosophical Society. Philadelphia. **63**/3: 1-149.

MOL D. & LACOMBAT F. 2009. *Mammuthus trogontherii* (Pohlig, 1885), the steppe mammoth of Nolhac. Preliminary report on a left and right upper M3, excavated at the ancient maar of Nolhac, Haute-Loire, Auvergne, France. *Quaternaire*. **20**(4): 569-574.

MUTIHAC V. 1990. Structura geologică a teritoriului României. Edit. Tehnică. București. 418 pp.

VAUFRAY R. 1958. Proboscidiens. Étude systématique. In: Piveteau J. (ed.): *Traité de paléontologie*. Masson et C^{ie}. Paris. Tom VI, vol. 2: 203-295.

* * * Geological map of Romania

Popescu Aurelian
Museum of Oltenia Craiova
Str. Popa Șapcă, nr. 8, 200422, Craiova, România
E-mail: aurelian_popescu@yahoo.fr

Diaconu Florina
Iron Gates Region Museum,
2nd Independenței Street, 220160 - Drobeta Turnu Severin
E-mail: florinadiaconu@yahoo.com

Received: March 12, 2015
Accepted: June 22, 2015

PLATE I
Molars of Salcia


Photo. 1a. M3 22/1420 – buccal view.


Photo. 1b. M3 22/1420 – occlusal view.

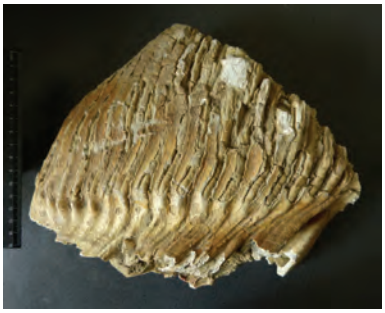
Photo. 1c. M3 22/1420 – lingual view.


Photo. 2a. m3 21/1421 – buccal view.


Photo. 2b. m3 21/1421 – occlusal view.


Photo. 2c. m3 21/1421 – lingual view.


Photo. 3a. m2 20/1422 – buccal view.


Photo. 3b. m2 20/1422 – occlusal view.


Photo. 3c. m2 20/1422 – lingual view.


Photo. 4a. m1 23/1423 – buccal view.


Photo. 4b. m1 23/1423 – occlusal view.


Photo. 4c. m1 23/1423 – lingual view.


Photo. 5a. m1 24/1424 – buccal view.


Photo. 5b. m1 24/1424 – occlusal view.


Photo. 5c. m1 24/1424 – lingual view.